The Lessons of Operation Desert Hammer VI, Part I: Materiel

The next three articles were published to report on Desert Hammer VI, an advanced warfighting experiment that tested many of the elements of a digital force. The first article focuses on materiel, the second on doctrine, and the third on training.

Lessons of Operation Desert Hammer VI: Materiel Could Be Improved

by Lawrence G. Vowels

(May-June 1995)

The Advanced Warfighting Experiment (AWE) known as Operation Desert Hammer VI utilized a large number of digital materiel systems. Some of the digital hardware had not been completely developed and, in some cases, was still embryonic. The intention of this article is not to discuss all of these developmental items, but to enumerate the materiel lessons learned from this experiment and examine the corrections to be applied to materiel as the Army moves toward digitization.

Suggestions for improvements to the hardware used in this experiment were solicited from after-action reviews, questionnaires, and group meetings with the NTC observers/controllers (O/C), subject matter experts (SME) from TRADOC schools and battle labs, and the participants from Task Force 1-70, Fort Knox, Ky. The suggestions from these personnel will not be attributed to any specific group because the similarity of each group's suggestions makes it nearly impossible to assign authorship.

General

The recurring theme in all O/C, SME, and participant comments is that digital systems should make the task "no harder than it is to do now." If a system adds tasks or makes the job more difficult, it will not be used. All digital systems should be designed to save time and reduce workload so that leaders can spend more time thinking, analyzing, and perceiving the battlefield.

Clearly, the Army needs to standardize the digital equipment and software across Battlefield Operating System (BOS). Responses repeatedly expressed the need for reliable, user-friendly, compatible, and accurate systems. The requirement for interconnectivity between all parts of the force cannot be overstated, because this network provides situational awareness about the location of all friendly forces. These standardized systems should, to the maximum extent possible, use a common set of protocols with the same report formats.

These interconnected systems require user-definable routing or addressing flexibility to support the task organization often required in a combined arms force. During this experiment, inflexible routing matrices frustrated the commander's attempts to task-organize by causing loss of digital communications links when task organization occurred. Since changes in task organization are essential, routing matrices and addresses must be user-defined and flexible.

TF leaders had to devote significant effort to ensuring that key digital transmissions were received. As interconnectivity problems became known, it became commonplace for leaders to query their subordinates by voice after a key digital transmission, to ensure that the message was received. This additional workload should be avoided by use of an electronic "roger," similar to that used in many electronic mail systems, that provides immediate feedback telling who received the message. This could be combined with a feature allowing the recipient to acknowledge the message through one or two "keystrokes."

Digital systems must find a way to eliminate the duplication of having to use both digital systems and the "normal" method using acetate and markers. Leaders do not have enough time to develop overlays and conduct operations using both. Efforts should be made to develop digital systems that are as easy

and reliable to use as the acetate overlay, the alcohol pen, and the paper map sheet.

Architecture

Leaders within TF 1-70 were sometimes unable to rapidly discern how many of their subordinates were linked digitally to their current operating network. This led to the participants, SMEs, and O/Cs to call for a "positive visual display of connectivity." By looking at a screen, a leader should be able to tell at a glance to whom he currently can digitally communicate.

The network architecture must be redundant to permit continuous information flow despite the loss of key vehicles due to maintenance failure or combat loss. The architecture must support the capability for the network to gracefully degrade. This means the architecture must support the re-routing of information by whatever means are necessary to get the information to the proper vehicles. To always ensure connectivity, there is a need for a re-transmission capability similar to that employed by the Enhanced Position Location Reporting System (EPLRS). This capability would attempt to send information to the proper vehicles repeatedly to make sure the information got through.

Digital message traffic was often competing with voice traffic over the SINCGARS radio. This resulted in a partial loss of both digital and voice messages. There is a very real need to eliminate the digital and voice competition, perhaps through a separate digital network. A separate network was endorsed by all groups of responders.

Continuous Communications

All respondents agreed that the digital systems must be rugged and reliable. They are required to operate under all battlefield conditions, including while the host vehicle is moving. In this experiment, some of the developmental digital systems did not prove to be consistently reliable.

There is a very urgent need for rapid log-on and reboot procedures for the digital systems. Leaders and soldiers can't be saddled with such time-consuming procedures (i.e., from 2-10 minutes) during operations or in combat. An automatic log-on when the vehicle is started is preferable. Additionally, the systems need to allow leaders to transfer easily and rapidly to another vehicle and take the setup of the digital system with them.

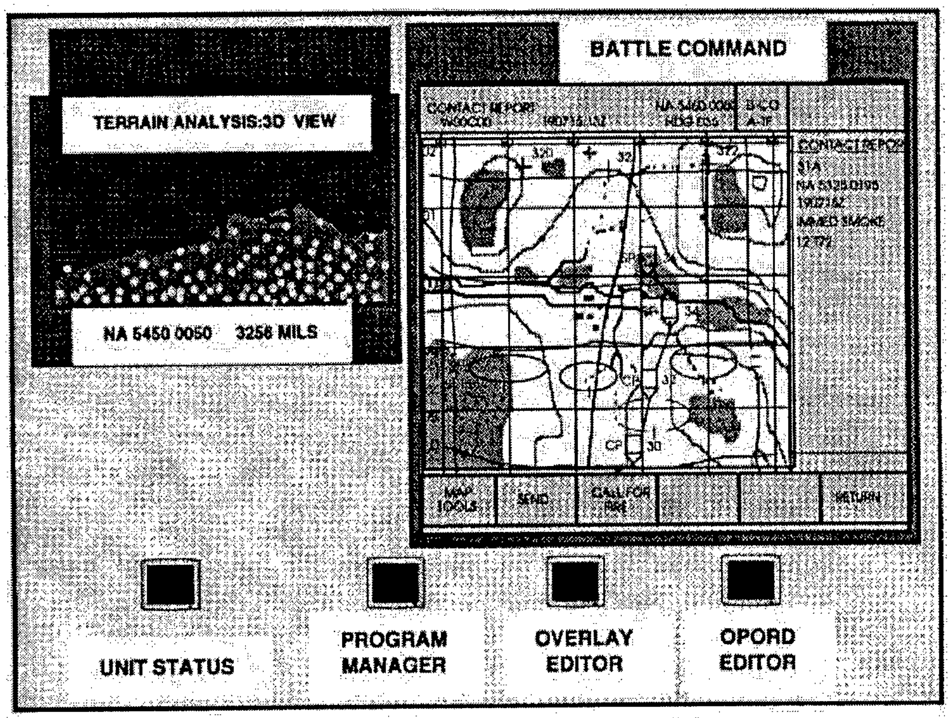

Figure 1. Digital System Display with Terrain Analysis Support System (Example)

Combat vehicles cannot run continuously to provide a power source for digital systems. There needs to be a way for the vehicle or network node to receive messages while the vehicle is shut down. This requires an advanced system and/or battery auxiliary power unit to provide electrical power to the vehicle's digital systems while it is powered down.

Display Configuration

Nearly every participant who commanded an M1A2 tank requested the IVIS display be moved so it could be viewed by glancing down while operating in open hatch mode. With the vehicle on the move, the tank commander prefers to operate head-out but occasionally needs to refer to the IVIS screen and doesn't want to keep dropping down to look at the IVIS screen or read an IVIS message. Several of the participants and SMEs suggested a Head-up Display (HUD) as a possible remedy.

Vehicle commanders and higher level leaders have a very limited time to view their screens and process information. The digital systems must, therefore, pack as much information as possible onto the screen. These displays should be tailorable and flexible, to the maximum extent possible, to allow for individual preference and ease of viewing under differing light conditions. The displays require variable contrast and intensity controls to permit use under light discipline and varying visibility conditions. The digital system display requires a flexible, tailorable, user-friendly graphical user interface like those available for personal computers and workstations. This flexibility is required to enable the operator to be able to operate concurrently in several different files and programs, with the added capability to rapidly shift between these files and programs.

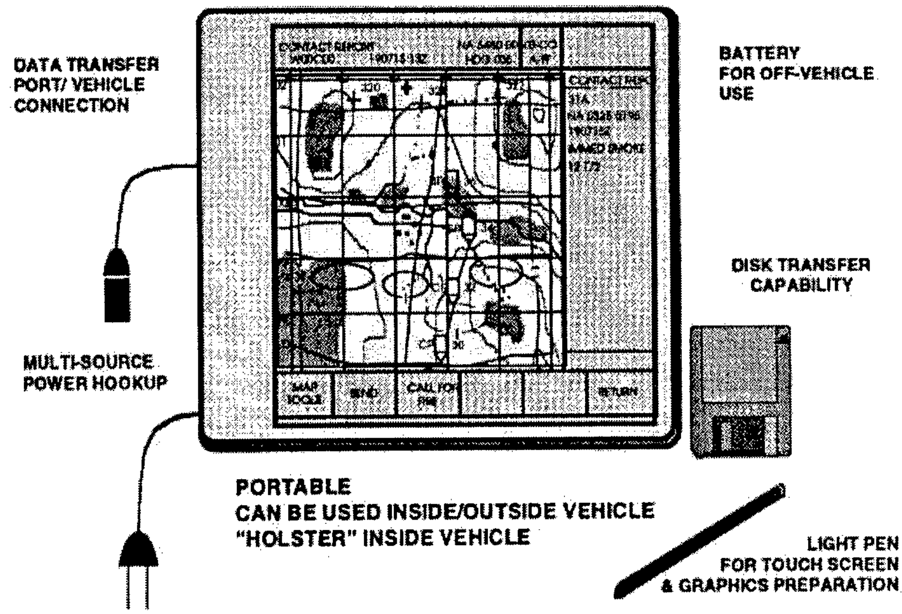

Figure 2. Portable Display (Example)

The display should portray the battlefield in a form familiar to soldiers, with all symbols conforming to the conventions of Field Manual 101-5-1. The display must show terrain features in a manner similar to the current paper map. An example of this type of display is shown in **Figure 1**. The capability to view vegetation, urban areas, and roads via separate overlays is desirable. During this experiment, the Terrabase system was used to perform terrain analysis during and prior to operations. A self-contained terrain database/terrain analysis system is required to permit leaders from platoon to brigade level to analyze terrain, perform line-of-sight analysis, and select routes.

Warrior Requirements

The fighter at platoon, company, and battalion requires a movable display, so he can view it while operating inside the vehicle or in the hatch. The display should also be removable to support dismounted leader functions. Currently, leaders at all levels use the paper map in places they cannot take their digital system (e.g., coordination, operation order briefings, and rehearsals). We need to make the digital system display portable for use as an "electronic mapsheet." The portable display should portray the current map, look "just like a map," and be portable like a map case. An example of the portable display is shown in **Figure 2**. The leader should be able to draw, modify, or transfer graphics easily and quickly on the display via a light pen or touch screen. This display must have a convertible power source to support this portability. Disk transfer and data transfer capabilities could permit quick transfer of overlays and other information from one electronic mapsheet to another.

During this rotation, digital overlay preparation suffered because the process on the current digital systems was so cumbersome and time-consuming. Leaders succumbed to the temptation to continue to use acetate graphic overlays (despite instances of inaccuracy) because of the time required for digital overlay preparation. It is essential that digital systems offer easy graphics preparation and modification.

Leaders also need a "notebook" embedded in the software for maintaining unit status. They could store personnel information and status, quickly call up fuel/ammunition status, review key basic load status, and store sensitive item status and maintenance status.

Along with these changes, there should be audible and visual signals cueing the leader to the reception of high priority messages. The warrior should also be warned when the vehicle nears known obstacles or contaminated areas. Finally, a high resolution printing capability is necessary at the company level to

print graphics and mapsheets for backup purposes, and for coordinating with non-digital units.

Battle Command Staff Requirements

Getting the battle command staff talking to one another while looking at the same map and graphics is the key to effective operations. Battalion and brigade staffs are concerned with large areas of terrain. Current computer display screens are much too small to permit several people to observe, and do not convey sufficient detail across a large enough area. A large flat screen capability could aid the staff to visualize the digitized battlefield.

Each key staff member and the commander require a personal console or workstation at times, especially during the planning phase. These consoles should have large screens and be capable of performing the work the individual requires. Additionally, the software should permit operators to trade or observe information from any of the other stations. The commander and staff should be able to get into any of the files or databases and call up any pertinent information. This would seem to call for a file server, where the working files can be stored and recalled by any staff member at any console.

One of the most difficult tasks a staff faces is the planning cycle and the need to synchronize more assets in less time. This experiment demonstrated the unit's need for additional planning aids. The O/Cs were most vocal in calling for a JANUS-like planning and wargaming tool that would allow comparative assessment of the available courses of action by the battle command staff. This tool could examine courses of action, not so much to measure which course of action is better, but to ensure that all available resources are synchronized. The tool should allow rapid modification of the scenario and provide a replay of the entire scenario.

On the digitized battlefield, leaders at the battalion and brigade level can easily become clearing houses for information. This was clearly shown during this experiment when the battalion S2 was inundated with intelligence information from the All Source Analysis System (ASAS). Software designed to minimize this problem would be of great benefit. Given the increased amount of information provided to leaders by the digital systems, it seems prudent to develop software that will filter or artificially manage the information before it is presented to the leader.

Software to aid in producing operations orders would be very helpful. Software that takes the selected course of action from the wargaming tool and develops the base order, the synchronization matrices, and the decision support matrices would relieve the staff from having to manually enter this during order production. This allows the computer to automate a personnel-intensive and time-consuming chore currently handled by the battalion and brigade staffs.

Wireless communications would be a significant enhancement to operation within vehicles, such as the Battle Command Vehicle (BCV), Command and Control Vehicle (C2V), and the M577. Within a vehicle, wireless headsets allow unrestricted movement and continuous communication, allowing staff members to perform their function from any needed position within or around the vehicle. In a larger headquarters using multiple vehicles, wireless local area network communications permit extensive information sharing and coordination without requiring personnel to meet face to face.

Scout Platoon Requirements

The SMEs and O/Cs both noted that the systems used by the task force scout platoon provided an "observation standoff" badly needed to enhance scout platoon mission accomplishment and survivability. The hand-held Unmanned Aerial Vehicle (UAV) provides a view over the next terrain feature, permitting identification of enemy without direct exposure of scouts. Improved forward-looking infrared sights permit acquisition at increased ranges. Combined with navigation and position location devices, scouts can accomplish their mission and make better use of terrain. Most importantly, the scouts need to receive an integrated, operate-on-the-move, digital communication system with far-target designation capability. In this way, scouts can move through an area and digitally "paint" the battlefield for the task force, helping the task force see the battlefield in unprecedented accuracy and detail.

Scout platoons will also need a dismounted digital capability, to support dismounted reconnaissance and observation posts. At a minimum, the dismounted capability should allow digital reports and messages. Ideally, dismounted scouts should have superior sights and far-target designation capabilities.

Combat Service Support Potential

Nearly all agreed that digital technology of this experiment has only begun to impact the combat service support arena. Software on the M1A2 tanks that provide ammunition and fuel status to logistical personnel was reliable, but presently the information is by vehicle only. This needs to be expanded so that the information can be "rolled-up" by platoon, company, and task force.

This information, transmitted to the combat trains command post and posted on a large screen, would allow tracking of each unit's logistics status. With this information, the logistician can better anticipate needs and be prepared to deliver supplies where required. It might even be possible to set certain supply levels for each unit, with an alarm sounding when the critical level is reached. This could lead to precision logistics, where only the supplies are delivered to the unit, instead of the standard Logistics Package (LOGPAC).

It was also suggested that digital technology could help the support platoon maintain a real-time asset inventory. This inventory could be structured to display what supplies are stored on each vehicle in the trains.

Other suggestions included software that would aid the executive officer in his doctrinal duties as a fighter and a combat service support operator. This software should assist him in these duties and make the chores easier to handle.

Conclusions

The responses indicate that current digital systems could all be improved. A number of new ways to use these systems were discovered during this experiment, and still other uses remain undiscovered. A few of the systems were relatively mature, and the proposed changes to these systems were few. Other systems were immature and many proposed changes were suggested.

The most important changes would be the development of a seamless digital communication network across all the BOS.

The development of a user-friendly interface for this network is imperative. This interface must be easy to use in a combat environment under all conditions. This is absolutely critical as the soldiers must use these systems to derive any benefit from them. The ability to rapidly and accurately log onto the network is imperative. The network requires a reliable, energy-efficient power source. The network must contain routing or addressing flexibility to handle the many task organizations the Army uses in a combined arms force. The architecture of the network should provide a built-in redundancy and degrade gracefully.

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